REYNVAANIA GALLICOLA, A NEW ERIOCOCCID CAUSING GALLS ON QUERCUS LINEATA BL.

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Docters van Leeuwen-Reynvaan and Docters van Leeuwen (1926, 1941[1]) have described 1930 different species of zoocecidia from Indonesia, collected from 1908 till 1932, during their residence in Java; 68 of these galls are ascribed to coccids.

These coccid galls are usually common malformations which consist of a shortening or swelling of the internodes, combined with bunching of the leaves; occasionally real witches' brooms are formed as in *Lansium domesticum* Jack (gall Nr. 644). Sometimes the leaves are curled and crumpled. In a few cases peculiar horn-like excrescences are found on the leaves, as in *Homalanthus populneus* Pax (Nr. 761), *Claoxylon indicum* Hassk. (Nr. 709)[2]), and *Santalum album* L. (Nr. 1624).

The entomologist, who is not a specialist in galls, will usually apply the name gall only to a typical malformation, inhabited by some stage of the insect that caused the gall and feeds upon it. Most of the coccid galls, described in the above-mentioned papers, he would simply call malformations, but he would certainly apply the name gall to the malformations on young oak twigs caused by the Eriococcid[3]) from Java and Sumatra which is described in the present paper.

This gall was described as follows (D. v. L. 1941, p. 135):

Nr. 1571. *Quercus lineata* Bl. A bud gall caused by a coccid. The terminal buds of the thin twigs are changed into a red-brown, plushy ball, 7 to 12 mm across. Sometimes full-grown leaves are attached to the galls. A white coccid lives inside; the wall is covered with a thick mass of red-brown hairs. Gall Nr. 21764. Java, Mt. Tangkoeban Prahoe near Bandoeng, alt. 1600 m, VII-1927; Mt. Papandajan, alt. 1400 m, J. Labohm coll., III-1932; Sumatra, Tapianoeli, Simakoek, alt. 1000 m, Forest Experimental Station leg., VII-1928.

On closer inspection it appears that the gall in question consists of a thick cluster of radially arranged buds, in which the scales are provided with a large number of long, flat, red-brown hairs, so that the gall resembles a plushy globule.

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[1]) Their papers are quoted in the following pages as: D. v. L. 1926, 1941. Gall numbers quoted refer to the serial numbers of the galls, not to their herbarium numbers.

[2]) The names which are valid at present are as follows. 1. *Lansium domesticum* Corr. (1807); Jack (1823). 2. *Claoxylon polot* (Burm. f., 1768) Merr. Syn. Cl. *indicum* Hassk. (1844). 3. *Homalanthus populneus* (Geisel.) Pax or *Omalanthus populneus* (Geisel.) O.K. The last mentioned genus was originally named *Omalanthus*, but afterwards the name was usually written *Homalanthus*. It has not yet been decided which name should be regarded as correct. I am indebted to the Rijksherbarium of Leiden for this information.

[3]) *Eriococcus* and allied genera are assigned to the family Kermidae in the system of Ferris (1937), to the fam. Eriococcidae (subfam. Eriococcinae) by Balachowsky (1942), and to the fam. Pseudococcidae (subfam. Eriococcinae) by Borchsenius (1949).

The gall is usually found at the tops of young twigs, but sometimes more downward. In the latter case the twig passes through the gall from whose base 2 or 3 ordinary leaves may arise. Sometimes the galls are elliptical or obtuse-triangular in outline, so that it seems that two or three galls have coalesced (Plate 2). Inside the gall there is an irregular cavity in which the coccid is lodged. As the coccid swells by the development of eggs and embryos, it takes a very irregular shape, due to the pressure of the surrounding buds (Plate 2, below). Some white matter, apparently wax secreted by the coccid, is usually found on the walls of the cavity. The coccids examined were wholly filled with full-grown embryos, and numerous first stage larvae were found between the hairs of the galls.

DOCTERS VAN LEEUWEN (1933) called attention to these peculiar galls at a meeting of the Netherlands Indian branch of the Netherlands Entomological Society, held in March 1932 at Buitenzorg (now called Bogor). KALSHOVEN demonstrated on this occasion material collected by the senior forestry officer J. LABOHM, on Mt. Papandajan, Java, at an altitude of 1400 m.

By the kindness of Dr KALSHOVEN I now could examine a sample of this material. It contained three adult coccids preserved in alcohol, and five dried specimens of the galls. By the courtesy of Prof. Dr H. J. LAM, director of the Rijksherbarium at Leiden, where the "Herbarium cecidiorum" of J. DOCTERS VAN LEEUWEN-REYNVAAN and W. M. DOCTERS VAN LEEUWEN is preserved, I could also examine 23 other dried specimens of these galls.

Microscopical preparations were made of the three adult females mentioned above, and also of the first stage larvae found when dissecting the galls provided by Dr. KALSHOVEN. Further two blackened and shrivelled adult specimens were found in dissecting the galls, but the microscopical preparations of these specimens were very unsatisfactory; only the anal region and the mouth parts were clearly visible. The preparations of the three adult females, which had been preserved during more than 20 years in alcohol and were crammed with embryos, were also less satisfactory. It was difficult to destroy the hardened tissues, further the structure of the cuticle was partly obscured by the large number of embryos and thick bundles of tracheae. As a slit on the dorsum was not satisfactory, the last specimen was simply cut into two halves to get rid of the embryos. To my regret young adult females without embryos, and more advanced larval stages, were not available; galls in the first stage of development were also absent in the material at hand.

Reynvaania gen. nov.

Type species: *Reynvaania gallicola* spec. nov.

Adult female. Antennae reduced to a strongly sclerotized tubercle with 5 blunt hairs on its top. Legs absent. Anal ring small, with a number of pores in 2—3 irregular rows, and 6 short spine-like anal hairs. Anal lobes obsolete. A group of stout hairs at the posterior end of the body, and a row of conical spines which are sharply pointed along the margin. Spiracles surrounded by a large number of stellate pores, mostly of the quinquelocular type. Other types of gland pores and tubular glands wanting.

Adult male not known.

First stage larva with 6-segmented antennae. Antennae, legs, and labium of the Eriococcid type. With a row of short conical spines around the margin of the body, and several quinquelocular pores on the ventral side.

The genus is named in honour of Mrs. J. Docters van Leeuwen-Reynvaan who together with Prof. Dr. W. M. Docters van Leeuwen described about 2000 zoocecidia from Indonesia (the former Netherlands East Indies).

Reynvaania gallicola spec. nov.

First stage larva. Dimensions of body ca. 500 × 250 μ. Margin surrounded by about 70 short spines. On the abdomen 2 spines are present on the sides of each segment. Behind the frontal spines 2 pairs of supplementary spines are found, further 2 spines on the mesal side of each anal lobe (fig. 7).

Antennae 6-segmented; length 120—130 μ (fig. 3). The basal segment has 3 hairs, segment II 2 hairs and the usual sensorium, segment III only 1 hair, and segment IV one sensory hair (without other hairs*)). On segment V 1 sensory hair and 4 ordinary hairs are present, on segment VI 5 ordinary hairs and 3 sensory ones. The sensory hairs on segments IV and V are in one line with one of the lower sensory hairs on segment VI.

Legs of the Eriococcid type, with elliptical sensoria on the trochanter, and with the claw-tip obliquely truncated. Tarsal and ungual digitules knobbed. The tarsus has a sensorium at its base on the outside (fig. 4).

Eyes present. Labium 2-segmented with a few hairs whose position is shown in fig. 5; rostral loop reaching behind the posterior legs (fig. 7).

Anal lobes slightly pronounced, with long apical hairs (ca. 250 μ) and 2 conical spines on their mesal side (fig. 6).

Anal ring 20—25 μ in diameter, with 2 rows of pores and 6 short anal hairs (ca. 25 μ). The anal ring is covered by the anal lobes; when these are pressed aside, the ring is exposed on the ventral surface. Two hairs (30—35 μ) are seen at the sides of the anal ring, and 2 others (shorter than the anal hairs) in front of the ring (fig. 6).

Abdomen with 2 or 4 longitudinal rows of very minute hairs, which are sometimes lacking, on the dorsal side, and with 6 rows of small hairs on the ventral side (fig. 7).

The ventral surface of the body is provided with a number of stellate pores of the quinquelocular type, but those near the spiracles may have 6—8 loculi. The position of these pores, which have a diameter of 6—7 μ, is as follows (see fig. 7): 7 pairs along the sides of the abdomen, one pore above the peritreme of each spiracle, one pore inside the base of each leg, and one pore on each side of the tentorium. On the posterior abdominal segments usually 1—4 pores are seen in the medioventral region (maximum observed : 7), but their occurrence is irregular. In a few cases 1—3 additional quinquelocular pores were found on the ex-

*) The same condition is found in the first stage larvae of *Eriococcus devoniensis* (Green), *E. insignis* Newst., *E. glyceriae* Green, and *Gossyparia spuria* (Modeer).

Figs. 1—2. Adult female of *Reynvaania gallicola*. 1. Seen from the ventral side (20 ×). At the left, separate figures showing marginal spines near posterior spiracle (430 ×), and stellate gland pores (630 ×). At the right, spine on front margin (430 ×), antenna seen from above and from the side (430 ×), and anal ring (630 ×). 2. Posterior end of body with two series of robust hairs, of which the upper one gradually changes into the row of marginal spines (200 ×). Separate figures show the transition of hairs to spines (430 ×).

terior side of the anterior spiracle; sometimes the abdominal pores were lacking in fully developed embryos, or even in newly born larvae.

Adult female. Body of mature female white, irregularly shaped, more or less angular; segmentation of abdomen visible; diameter about 5 mm (fig. 1 and plate 2, below). Lives on *Quercus lineata* Bl. inside bud galls which by an abundant development of long brown hairs have the appearance of a plushy globule, with a diameter of 15 mm in the larger specimens (plate 2, below).

Antennae reduced to a strongly sclerotized tubercle with 5 blunt hairs on its top which seem to represent the 5 sensory hairs of the larval antenna (fig. 1); length and width ca. 25 μ. Sometimes it seems as if the antenna is 2-segmented, but the basal part is only a thickening or fold of the cuticle around the base of the sclerotized tubercle.

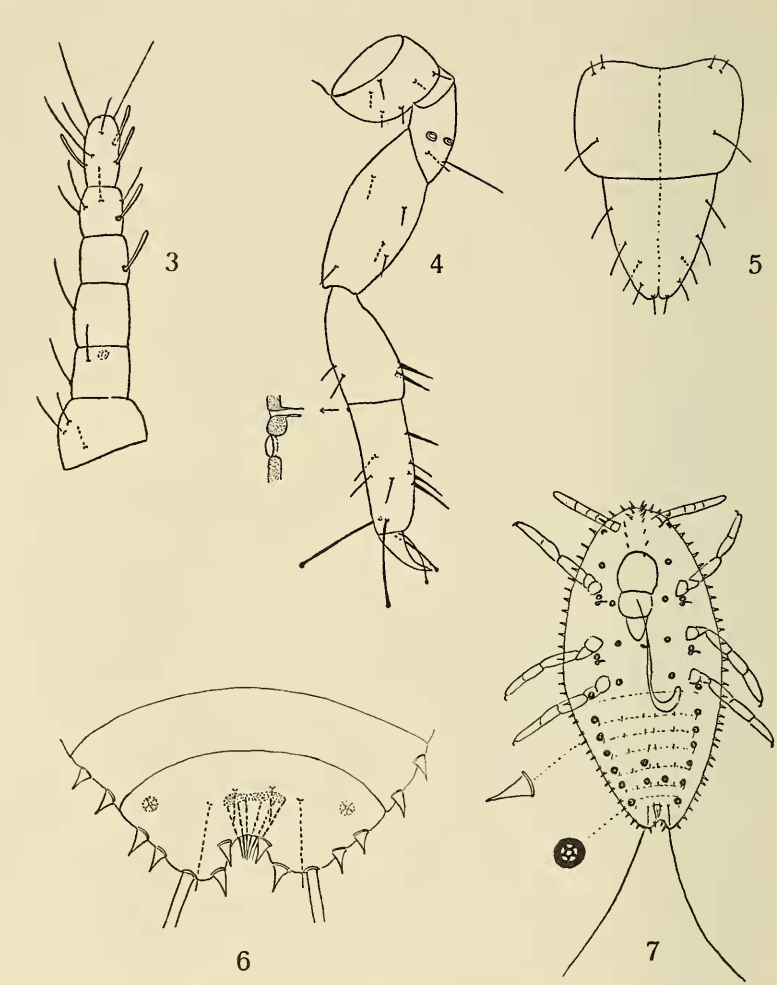
Labium 2-segmented, of the same shape, and with the same set of hairs as in the first stage larva (cf. fig. 5); length 140—150 μ, in the larvae of the first stage about 80 μ. Rostral loop short, attaining about 4 times the length of the labium. Legs absent.

Anal ring small (50—60 μ in diameter), with several pores arranged in 2—3 irregular rows, and 6 short spine-like anal hairs (20—30 μ in length) which are placed near the outer edge of the ring (fig. 1). Anal lobes obsolete.

Two rows of robust hairs are observed at the posterior end of the body; one row contains 6—7 and the second one 3 hairs (fig. 2). The first row is continued as a series of conical spines which surrounds the body near its margin. Around the whole margin about 60 spines could be counted, 12—16 of them are found in front of the antennal rudiments. The conical spines along the sides of the body are somewhat variable in shape, and usually finely pointed. The points of the spines are sometimes slightly bent, and may be so long that the shape of the spine approaches that of the robust hairs at the end of the body (figs. 1, 2).

The spiracles are large (opening 50—55 μ), and connected with a thick bundle of numerous tracheae. Several stellate pores are observed in the neighbourhood of the spiracles, about 50 near the anterior spiracle and nearly 100 near the posterior one (fig. 1). The stellate pores are variable in size (6—8 μ), and usually of the quinquelocular type. Near the posterior spiracle 20—30 pores of the larger type are present with 6—10 loculi; a few of the larger pores near the anterior spiracle and elsewhere may also have 6 loculi.

Only disk-pores of the stellate type were observed; tubular glands are absent. Outside the area of the spiracles wax pores are sparsely distributed. A few quinquelocular pores are found near the rudimentary antennae, more (about 40) around the mouth-parts. Along the ventral margin of the body quinquelocular pores are observed over $^2/_3$ the distance between the posterior spiracle and the anal opening, but in the posterior half of this area the pores are very sparse, and mostly obsolete, with one loculus. As far as could be observed stellate pores are very scarce on the abdomen; not more than 5 could be found on the mesoventral side of the segments in front of the anal opening. Between the robust hairs of the anal region (fig. 2) a number of small pores is present of which only the largest ones have 5 loculi; the smaller ones have only one loculus and seem to be atrophied quinquelocular pores. The correct distribution of the wax pores is somewhat



Figs. 3—7. First stage larva. 3. Antenna (430 ×). 4. Hind leg (430 ×). Separate figure: sensorium at base of tarsus (ca. 1300 ×). 5. Labium from the ventral side (430 ×). 6. Posterior end of body from the dorsal side (430 ×). 7 Newly emerged larva, seen from the ventral side, showing position of the quinquelocular pores (90 ×). Separate figures show marginal spine and quinquelocular pore (630 ×).

uncertain, as the old specimens were disfigured by the development of numerous embryos and an irregular pressure inside the gall-cavity (plate 2, below), further by mounting the large specimens on slides; young adults more suited for mounting were not available. Some minute hairs are observed on the ventral side of the abdomen and very few on the thorax; they seem to be absent on the dorsal side.

The species is ovoviviparous; the body of mature females is filled with a large number of full-grown embryos. The insects were collected in Java and Sumatra, at an altitude of 1000—1600 m, on *Quercus lineata* Bl., in bud galls as described above. Types in the Zoological Museum at Amsterdam.

Relationships. Cockerell (1896) and Ferris (1950) have described two species of Eriococcidae which cause galls on *Quercus,* viz. *Olliffiella cristicola* Ckll. from New Mexico (U.S.A.) and *Fulbrightia gallicola* Ferris from the Yunnan Province in Southern China. Both species are the types of their genera. It seems that our new species does not fit well into these genera. It is certainly different in structure from *Olliffiella,* and its gall is of quite another type. Our species, including its gall, shows more resemblance to *Fulbrightia.* The abnormal long hairs of the bud scales found in the gall of *Reynvaania* are absent in the galls of *Fulbrightia,* but the food plant of the latter is another species of *Quercus,* viz. *Q. delavayi.*

The adult female of the Javanese species differs from that of *Fulbrightia gallicola* in the following respects. (1) The stellate pores are mostly of the quinquelocular type (excepting a group of 20—30 pores with 6—10 loculi near the posterior spiracle), and the distribution of these pores is different from that in *Fulbrightia.* Small pores with the shape of the figure 8 are absent in *Reynvaania.* (2) Legs are wholly absent. (3) The structure of the rudimentary antennae and anal ring is somewhat different. (4) The robust hairs at the posterior end of the body (fig. 2) seem to be absent in *Fulbrightia,* as far as can be derived from Ferris' description and figure. The first stage larva differs from that of *Fulbrightia gallicola* in the following points. (1) It has a typical set of quinquelocular pores on the venter (fig. 7). (2) The apical hairs on the anal lobes are 6—8 times as long as those at the sides of the anal opening (cf. fig. 7); according to Ferris' figure the ratio in *Fulbrightia gallicola* is about 1 : 2.5. (3) The abdominal segments have two spines on each side; in *Fulbrightia* there are three marginal spines on each side according to Ferris' figure. The figure of the larval antenna of *Fulbrightia* is not detailed enough to compare it with that of *Reynvaania.*

The arguments for separation of the two genera are somewhat meagre, but the structure of the adult females (reduced by their life in galls) offers few characteristics; the structure of the first stage larvae seems to show considerable differences. Unfortunately second stage larvae and young females were not available among the material of *Reynvaania gallicola*; males are at present unknown in *Reynvaania* as well as in *Fulbrightia.*

Coccid galls in the "Herbarium cecidiorum"

As I have seen nearly all the coccid galls from Indonesia which are represented in the "Herbarium cecidiorum" of Mrs. and Dr. Docters van Leeuwen, a few remarks on these galls may be added to the present paper. Only three species from the above mentioned galls have been previously identified, viz. *Aspidiotus* (*Evaspidiotus*) *pustulans* Green from gall Nr. 553 (on *Erythrina lithosperma* Miq.) and *Lecaniodiaspis azadirachtae* Green from gall Nr. 1654 (on *Derris elliptica* Bth.). The first insect was described by Green (1905), and the second identified

by TAKAHASHI (VAN DER MEER MOHR 1932). A common malformation of *Hibiscus rosa-sinensis* L. in Java (D. v. L. 1926, gall Nr. 942) is caused by *Phenacoccus hirsutus* Green (BETREM 1937).

About 60 sheets with coccid galls from the above-mentioned „Herbarium cecidiorum" could be examined. Only in 15 species of galls coccids were visible on the outside so that they could be collected without damaging the herbarium specimens. I suppose that these coccids were the insects to which the galls have been ascribed. Coccids which were certainly accessory (e.g., *Coccus hesperidum* L. on some leaves) have been left out of consideration.

In two cases the scale insects proved to be Aleurodidae (Nrs. 273 and 362). In two other cases (Nrs. 472 and 644) an *Asterolecanium* spec. was present on the affected parts; it was not possible to identify these species with RUSSELL's monograph (1941) so that they probably belong to an undescribed species. In Nr. 472 the petiole of *Hernandia peltata* Meissn. shows pustules with a sunken top, similar to the malformations on young oak twigs caused by *Asterolecanium variolosum* Ratz. in Europe. In Nr. 644, *Lansium domesticum* Corr., the scale insects are lodged in deep pits on the twigs, and the shoots are changed into a kind of witches' broom. There can be little doubt that in both cases the malformation or gall was caused by an *Asterolecanium* spec. Witches' brooms on *Lansium domesticum,* caused by an *Asterolecanium,* are also mentioned and figured by KALSHOVEN (1950, p. 304, fig. 153).

In Nr. 517, a sprout gall on *Cassia siamea* Lam. ascribed to a *Dactylopius* spec., I could only find a few legs of a *Pseudococcid* which could not be identified.

Gall Nr. 1571 on *Quercus lineata* Bl. is caused by the Eriococcid described above as *Reynvaania gallicola* gen. nov. spec. nov.

In the remaining cases Diaspidinae were collected, which in galls Nrs. 233, 247, 285, 709, 761, 1121 and 1624 belonged to the tribe Diaspidini, and in galls Nrs. 381 and 511 to the tribe Aspidiotini (according to FERRIS' system). No attempt has been made to identify these Diaspidinae, as the material was usually very incomplete (e.g., only immature stages of the female or male puparia present). A large part of the indispensable literature on Asiatic Diaspidinae is not available in Holland, neither are specimens for comparison; furthermore I have little experience with this large subfamily, of which about 1300 species have been described, i.e. one-third of all known coccids. Probably many new species, perhaps new genera, will be found among the Diaspidinae associated with coccid galls in Indonesia. For a thorough examination of these Diaspidinae alcohol material will be needed, and an expert, well at home in this large subfamily, who has all publications on Diaspidinae from South and East Asia at his disposal, and has access to large collections with specimens for comparison. Our knowledge of the scale insects of Indonesia is at present very limited. The principal economic species have been studied (cf. KALSHOVEN 1950—1951), but few of the non-economic ones have been considered. When GREEN (1930) examined some scale insects from Sumatra, he had to state that from this large island (area 445000 sq.km) with its rich tropical fauna "barely half-a-dozen species of Coccidae had been reported". BETREM (1937), however, has published a valuable survey of the principal Pseudococcidae of Java.

With reference to Indonesian galls caused by Diaspidinae, I may call special attention to the peculiar hollow horn-like excrescences on the leaves of *Claoxylon indicum* Hassk. (D.v.L. 1926, figs. 497 and 498), of *Homolanthus populneus* Pax (D.v.L. 1926, fig. 543), and of *Santalum album* L. (D.v.L. 1941, gall Nr. 1624). The Diaspidinae on their leaves resemble the genus *Chionaspis* Sign.; besides female specimens male puparia were present.

In 1952 I received from Mr. D. Hille Ris Lambers a large sample of Pseudococcidae which cause a malformation of the stem top of young teak plants (*Tectona grandis* L.). The internodes remain short, and the curling lumpy leaves form a bunch (cf. D.v.L. 1926, gall Nr. 1310). The insects had been collected by the senior forestry officer F. W. Rappard in East Java (South Djember, 2.XI. 1952), and were identified with Betrem's paper (1937) as *Pseudococcus lilacinus* Ckll. (= *P. crotonis* Green = *P. tayabanus* Ckll.). The insects were very numerous on the malformed leaves, especially at the base of the midrib. Afterwards I learned from Dr. Kalshoven that in 1928 he already reported *Pseudococcus crotonis* Green as a pest of young teak (Tectona, vol. 21, p. 610).

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